

New claim 55 is directed toward an integrated process for the production of a dialkyl carbonate and a diol that **consists essentially of** reacting an alkylene oxide with carbon dioxide in the presence of a homogeneous carbonation catalyst to provide a crude cyclic carbonate stream comprising a cyclic carbonate and the homogeneous carbonation catalyst. The cyclic carbonate is then reacted with an aliphatic monohydric alcohol in the presence of the homogeneous carbonation catalyst from the crude cyclic carbonate stream to provide a crude product stream of dialkyl carbonate and diol.

New claim 56 is directed toward an integrated process for the production of a dialkyl carbonate and a diol that comprises reacting an alkylene oxide with carbon dioxide in the presence of a homogeneous carbonation catalyst at 150 to 200 °C and 1379 kPa to provide a crude cyclic carbonate stream comprising cyclic carbonate and the homogeneous carbonation catalyst. The cyclic carbonate is then reacted with an aliphatic monohydric alcohol in the presence of the homogeneous carbonation catalyst from the crude cyclic carbonate stream at 75 to 170 °C to provide a crude product stream comprising a dialkyl carbonate and a diol. The crude product stream is separated into two different recycle streams. The first recycle stream comprises unreacted aliphatic monohydric alcohol and is recycled to the second reaction, or tranesterification step. The second recycle stream comprises unreacted cyclic carbonate and the homogeneous carbonation catalyst and is recycled to either the first reaction, or carbonation step, and/or a portion is recycled to the second reaction.

Buysch teaches a process for producing a dialkyl carbonate and a diol by reacting alkylene oxides with aliphatic and/or cycloaliphatic alcohols and carbon dioxide in the presence of catalysts. The reaction components are simultaneously added into the reactor.

Chem Systems teaches a process of making dialkyl carbonate and a diol from alkylene oxide, carbon dioxide, and an aliphatic monohydric alcohol. The process comprises the steps of reacting an alkylene oxide with carbon dioxide in the presence of a

catalyst in one reactor, removing the catalyst from the product stream through separation, feeding the separated product stream into a second reactor, and reacting the cyclic carbonate in the separated product stream with an aliphatic monohydric alcohol in the presence of another catalyst.

It is respectfully submitted that contrary to the Examiner's contention, a *prima facie* case of obviousness has not been established. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. *In re Rouffet*, 149 F.3d 1350, 1357, 47 U.S.P.Q.2d 1453, 1457-58 (Fed. Cir. 1998); *In re Fine*, 837 F.2d 1071, 1074, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). Second, there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Lastly, the prior art reference must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 983-85, 180 U.S.P.Q. 580 (C.C.P.A. 1974).

It is respectfully submitted that the cited references, taken either alone or in combination, fail to teach or suggest all of the limitations recited in claim 1 or in new claims 55 and 56. The integrated process of the claimed invention requires the sequential introduction of the reaction components into the reactors. The carbonation reactor 1 is charged with alkylene oxide, carbon dioxide, and catalyst. The carbonation reactor effluent 5 contains cyclic carbonate, unreacted carbon dioxide, a small amount of unreacted alkylene oxide, homogeneous catalyst, and by-product impurities. After the carbon dioxide is flashed, the effluent passes into a transesterification reactor 11. An aliphatic monohydric alcohol is also fed into the transesterification reactor 11 via line 12. The transesterification reactor effluent 13 contains the products.

The Examiner argues that the addition of ingredients sequentially, instead of simultaneously as taught in Buysch, is *prima facie* obvious because one skilled in the art

would expect to obtain a dialkyl carbonate and a diol. Applicants respectfully argue that the Examiner has failed to specifically point out how the claimed integrated process is *prima facie* obvious in view of Buysch. Applicants respectfully submit that catalysis itself is an unpredictable art and, therefore, the addition of the chemicals simultaneously does not make obvious that the sequential addition of the chemicals would result in dialkyl carbonate and diol. *In re Mercier*, 515 F.2d 1161, 1167-68, 185 U.S.P.Q. 774 (C.C.P.A. 1975). No objective evidence is cited to support the contention that the concurrent addition of the reactants would give the same results as applicants' sequential addition of reactants. Furthermore, Examiner's own reference underscores the unpredictability of catalysis. In Buysch, Examples 1, 4, 7, and 9, all have different product yields. Example 1 uses **both** 1 gram of sodium iodide and 0.2 gram of thallium carbonate and yields 51 grams of dimethyl carbonate. Example 4 uses **only** 1 gram of sodium iodide and yields 57 grams of dimethyl carbonate. Example 7 uses **only** 0.2 gram of sodium carbonate as the catalyst and yields 23 grams of dimethyl carbonate. Example 9 uses 1 gram of imidazole and yields 18 grams of dimethyl carbonate. These Examples underscore applicants' contention that the reference does not provide a reasonable expectation of success of applicants' claimed subject matter.

The Examiner argues that the optimization of variables in a known process is *prima facie* obvious, therefore, the claimed integrated process is obvious in view of Chem Systems. Furthermore, the Examiner argues that Chem Systems teaches a carbonation step and a transesterification step in the presence of a carbonation catalyst. Applicants respectfully submit that Chem Systems requires the removal of the catalyst from the effluent stream between the carbonation and transesterification steps. (pg. 27-29 of Chem Systems). The present claimed invention requires that the catalyst not be removed from the effluent stream from the carbonation step that enters the transesterification step. The combination of Buysch and Chem Systems would provide the concurrent addition of all reagents (Buysch), the removal of the catalyst (Chem Systems) after the first step and reintroduction of the catalyst into the second step. One of ordinary skill in the art would not be motivated to perform a useless removal and

reintroduction of the same catalyst in two separate vessels in the same system. Claim 1 has been amended and claim 55 has been added to reflect this requirement.

Therefore, the cited references, taken either alone or in combination, fail to disclose or suggest each and every limitation recited in claim 1. As such, claims 1, 55, and 56, as well as claims 2 through 13, which depend either directly or indirectly from claim 1, are patentably distinguishable over the cited references.

In summary, Applicants submit that the pending claims are patentable over the cited references. It is respectfully submitted that the claims overcome the rejections set forth in the Final Office Action, and thus place the claims in condition for allowance. Reconsideration and withdrawal of all rejections of the claims are respectfully requested.

Respectfully submitted,

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